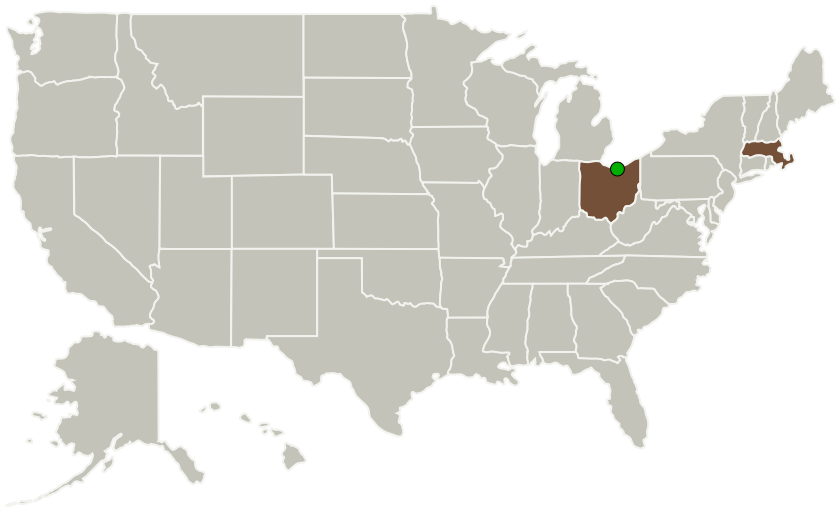
Electrospray Propulsion Engineering Toolkit (ESPET), Phase I

Completed Technology Project (2015 - 2015)

Project Introduction

To accelerate the development of scaled-up Electrospray Propulsion emitter array systems with practical thrust levels, Spectral Sciences, Inc. (SSI), in collaboration with Busek Co. Inc., proposes the development of an Electrospray Propulsion Engineering Toolkit (ESPET). The innovation is a multi-scale model that extends experimental and detailed high-level physics characterization of microfluidic components to full-scale ESP microfluidic network performance through an engineering tool with a central database of critical microfluidic properties. The tool is designed to allow ESP system engineers to efficiently narrow down the system component trade space and thereby substantially reduce the development time of advanced ESP systems. The physics underlying a microfluidic network of an ESP system covers multiple scale lengths that render the application of high-level CFD or atomistic molecular dynamics (MD) simulations over the entire system impractical. ESPET takes an engineering model approach that breaks the ESP system down into multiple microfluidic components or domains that can be described by analytical microfluidic solutions and specific parameters of the domain. The Phase I effort consists of a proof-of-principle of ESPET on the microfluidics of the Busek 100 micro Newton class ionic liquid ESP system. In Phase II, full development of ESPET for arbitrary designs will occur, including construction of the microfluidics properties database.

Primary U.S. Work Locations and Key Partners



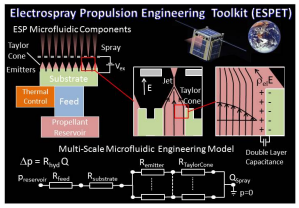


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Table of Contents

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
Spectral Sciences, Inc.	Lead Organization	Industry	Burlington, Massachusetts
Glenn Research Center(GRC)	Supporting Organization	NASA Center	Cleveland, Ohio

Primary U.S. Work Locations	
Massachusetts	Ohio

Project Transitions

June 2015: Project Start

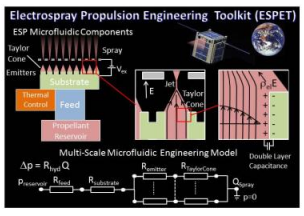
December 2015: Closed out

Closeout Summary: Electrospray Propulsion Engineering Toolkit (ESPET), Phase I Project Image

Closeout Documentation:

- Final Summary Chart Image*(https://techport.nasa.gov/file/138832)*

Images



Briefing Chart Image
Electrospray Propulsion Engineering Toolkit (ESPET), Phase I *(https://techport.nasa.gov/image/129073)*

Organizational Responsibility

Responsible Mission Directorate:
Space Technology Mission Directorate (STMD)

Lead Organization:
Spectral Sciences, Inc.

Responsible Program:
Small Business Innovation Research/Small Business Tech Transfer

Project Management

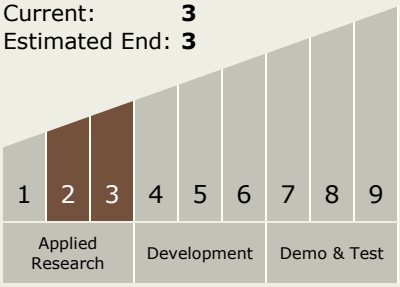
Program Director:
Jason L Kessler

Program Manager:
Carlos Torrez

Principal Investigator:
Rainer A Dressler

Technology Maturity (TRL)

Start: **2**
Current: **3**
Estimated End: **3**



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Technology Areas

Primary:

- TX11 Software, Modeling, Simulation, and Information Processing
  - TX11.2 Modeling
    - TX11.2.2 Integrated Hardware and Software Modeling

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System